

Section - 1300 NOISE

1300.00 NOISE [Revised June 2007]

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Section - 1300 NOISE

Section 1310.00 - Introduction

To help ensure that comparative analyses of project alternatives include consideration for minimizing or avoiding traffic noise impacts, comprehensive planning and coordination should be accomplished as early as possible in the project development process. This could reduce or eliminate the need for costly abatement later in the design process. This section focuses primarily on environmental noise procedures for highways. The level of noise (defined as unwanted sound) near state highways depends on six things:

- Traffic volume
- Speed of the traffic
- Percentage of trucks in the flow of traffic
- Distance to the highway
- Intervening topography and structures
- Atmospheric conditions

The Federal Highway Administration (FHWA) has established Noise Abatement Criteria guidelines (absolute noise impact) for several categories of land use activities; which include the following Leq noise levels excerpted from 23 CFR 772:

Category A	Leq = 57 dBA	Lands on which "serenity and quiet are of extraordinary significance and serve an important public need and...".
Category B	Leq = 67 dBA	Picnic areas, recreation areas, parks, residences, motels, schools, churches, libraries, and hospitals.
Category C	Leq = 72 dBA	Developed lands, properties or activities not included in Category A or B (i.e., most commercial and industrial Activities).
Category D	Leq = --	Undeveloped lands.
Category E	Leq = 52 dBA	Interior of residences, libraries, ... etc.

In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.

Heavier traffic volumes, higher speeds, and a greater percentage of trucks generally increase traffic noise. ITD has several strategies for controlling highway noise which can help supplement this Noise Policy, as noted below:

- Preserve existing buffer zones. Work with local jurisdictions to retain lands adjacent to highways in open space uses, promote the use of berms, and preserve beneficial topographic features along with the use of trees, shrubs, and other vegetation to soften the landscape.
- Support local jurisdictions in establishing principal routes for buses and trucks.
- Review local land use plans and advise local agencies to help achieve compatible development along highways.
- Identify potential noise impacts and mitigation measures early in the planning and design stages of highway improvements.
- When applicable, purchase R/W for lane additions from the side least affected by noise and other environmental impacts rather than purchasing equal amounts of R/W from each side. This strategy not only reduces environmental impacts, it reduces the number of R/W negotiations with adjacent property owners and can improve noise levels for residences on the opposite side of the road.

1310.01 Summary of Requirements

A traffic noise analysis is required by law for Type I federally funded projects. Type I projects:

- Involve construction of a highway on new location,
- Substantially changes the horizontal or vertical alignment of an existing highway,
- Increase the number of through traffic lanes on an existing highway.

FHWA policy memorandums have clarified that “increasing the number of through traffic lanes on an existing highway” includes:

- The addition of ramps or ramp lanes at interchange locations,
- The addition of an auxiliary lane between Interchanges if the lane is at least 1.5 miles long or if the lane is made continuous through a series of successive Interchanges, or
- The addition of a full lane to a highway.

In rare cases, a traffic noise analysis is also required for projects that are not Type I. This occurs when the project itself creates a noise impact, for instance when a side slope or berm is flattened for design purposes and adjacent noise sensitive receptors are affected.

Section 1350.00 provides technical guidance for implementing the noise analysis process.

1310.02 Abbreviations and Acronyms

Abbreviations and acronyms used in this section are listed below. Others are found in the general list in the appendix.

- **dBA** ---- A-weighted decibels
- **DHV**--- Design Hour Volume (30th highest traffic volume in a given year)
- **FHWA** – Federal Highway Administration
- **ITD** ----- Idaho Transportation Department
- **Leq** ----- Equivalent sound level
- **LHTAC** Local Highway Technical Assistance Council

- **LOS** --- Level-of-Service
- **NAC** ---- Noise Abatement Criteria
- **TNM**---- Traffic Noise Model

1310.03 Glossary

Abatement – An action taken to reduce the impact of highway traffic noise.

Abatement Measures – Measures that must be considered in a traffic noise impact report when a highway project will result in a noise impact. This includes the following six measures:

- Traffic management,
- Alteration of horizontal and vertical alignments,
- Acquisition of real property to serve as a buffer zone,
- Construction of noise barriers,
- Acquisition of property rights for barrier construction purposes, and
- Insulation of public use, nonprofit institutional structures.

‘Absolute’ Noise Impact – One of two criteria used to determine when a noise impact occurs. Under this criterion, a noise impact occurs when the predicted noise level approaches or exceeds the FHWA Noise Abatement Criteria (NAC).

Alpha Factor – Modeling term used to differentiate terrain reflective characteristics. For example, decibel levels decrease 3 dB per doubling of distance over asphalt or concrete (‘hard’ alpha), and 4.5 dB per doubling of distance over plowed ground or ground thickly covered with vegetation (‘soft’ alpha).

Approach – Means one (1) dBA below the FHWA “Absolute” noise impact criterion.

Barrier Cost Planning Estimate – Determined by multiplying the length times the adjusted height of a proposed noise wall by \$21 sq.ft. regarding walls over a quarter mile long, or by \$26.50 sq.ft. for a proposed wall less than a quarter mile long. (The adjusted height of a noise wall means the height of the wall above roadway centerline, plus 4 feet.) {These costs are applicable until August 2009; updated cost information will be evaluated at that time, as described in Section 1350.08}.

In addition to the above cost estimate, premiums are added if the adjusted height exceeds 16 feet, or the proposed wall is located within the clear zone of the roadway (i.e., within 30 feet of the pavement).

- Height premium = \$1.00 per foot over 16 feet
- Clear Zone Premium = 10% of total cost

[For example, if the TNM model indicates that a 250 ft. long, 14 ft. high wall is required to effectively abate the noise impact to several single family residences; then instead of using \$26.50 sq.ft., one would use \$28.50 sq.ft. for the cost

estimate (i.e., adjusted height = 14ft. + 4 ft. = 18 ft. or 2 ft. above 16 ft.). In this case, the estimated cost of the proposed wall would be \$128,250 (250' x 18' x \$28.50); and if located in the clear zone, a 10% premium or \$12,825 would be added for impact load requirements (collisions), for a total Barrier Cost Planning Estimate of \$141,075.]

Benefited Receptor – A receptor that is projected to receive a noise reduction of 5 decibels (dBA), or more, as a result of proposed noise mitigation measures. All benefited receptors should be included when counting receptors, regardless of whether or not they were identified as impacted. Each unit in a multifamily building should be counted as a receptor in determining impacts; each benefited unit should be counted as a receptor in determining benefits.

Cost/Benefited Receptor – The dollar amount used in determining cost reasonableness of noise abatement. Currently this amount equals \$22,500 per benefited receptor. {The \$22,500 per receptor amount has been established for use until August 2009; it will be re-evaluated and possibly updated at that time, as described in section 1350.08.}

Cost Effectiveness – Determined by multiplying the total number of benefited receptors by \$22,500 and subtracting the estimated cost of constructing an effective noise wall. A positive remainder means the barrier is cost effective.

dBA – The most generally used measure of the magnitude of traffic noise. The decibel (dB) or one-tenth of a Bel is a measure on a logarithmic scale which indicates the ratio between two sound powers. A ratio of 2 in power corresponds to a difference of 3 dB between the two sounds. The 'A'-weighting tends to de-emphasize lower-frequency sounds (e.g., below 1,000 Hertz) and higher frequency sounds (above 4 Kilohertz) in an effort to mimic human hearing.

Date of Public Knowledge – The date of approval of the environmental determination (CE, FONSI or ROD) for a highway project. After this date, federal and state governments are no longer responsible for providing noise abatement for new development adjacent to the highway project.

Design Hourly Volume (DHV) – The traffic volume determined by ITD to normally represent the worst hourly traffic noise impacts on a regular basis in a given year. The DHV is used for design purposes as well as to model 'current' and 'design year' noise levels. These traffic volume estimates must be obtained from ITD District; exceptions may involve local roads.

Design Year – The future year used to estimate the probable traffic volume for which a highway is designed, usually 10 to 20 years from the beginning of construction.

Desirable – Means that a majority of impacted landowners want a proposed noise barrier.
Note: In the case of residential neighborhoods, desirability should generally be determined after a noise barrier has been judged to be both feasible & reasonable to avoid false expectations.

In the case of commercial developments, desirability can often be put to the property owners upfront; since noisewalls limit business exposure and are therefore generally found to be undesirable by the business community – even if otherwise found to be reasonable and feasible.

Effective Noise Wall – A noise wall that provides a minimum insertion loss of 10 dBA at 10 feet and 5 dBA at 100 feet behind the wall, as well as a minimum 5 dBA insertion loss within 10 feet of the receptor(s) of concern.

Feasible – Means an effective noise wall/berm can be constructed considering the following engineering factors:

- Topography & Drainage
- Access re: driveways, sidewalks, ramps, etc.
- Cross Streets
- Other Noise Sources
- Safety & Maintenance

Insertion Loss – The net change in noise level at a receiver location due to the installation of a barrier. For purposes of this document, the term may be used interchangeably with “attenuation” or “noise reduction”.

Leq – The equivalent steady-state sound level, expressed in decibels, which in a stated period of time (e.g., design hour) contains the same acoustic energy as the time-varying sound level during the same period of time.

Level of Service – A qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as highway type, speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, safety, and traffic volume.

Noise Abatement Criteria (NAC) – Noise levels for various activities or land uses established by FHWA, that are used to determine when an ‘Absolute’ noise impact occurs. NAC are not to be used as a design goal for a noise abatement measure.

Planned, Designed and Programmed – Means that the building permit(s) for development of undeveloped land has been issued by the local jurisdiction at the time of the noise analysis, or that the implementation of an approved final plat is in progress (i.e., streets and utilities are in place or under construction).

Reasonable – Means that a feasible noise wall/berm is appropriate to construct considering such items as the following socio-economic factors:

- Barrier Cost Effectiveness
- If development pre-dated highway
- Extent to which proposed project impacts existing decibel levels
- Extent to which proposed project impacts projected decibel levels
- Local jurisdictional commitments to traffic noise abatement
 1. Land Use Plans & Policies

2. Zoning re: types of uses permitted adjacent to arterials
 3. Subdivision Regs. re: requirements for berms, setbacks, etc.
 4. Building Permits re: noise insulation
- Type of development to be protected (i.e., sensitive/noise tolerant)

Receiver – Alternative to the term ‘receptor’.

Receptor – Residences, businesses and outdoor areas where highway traffic noise may affect frequent human activities. The closest corner of a residence (or business receptor) to highway centerline is to be used as the receptor location in modeling traffic noise impacts and attenuation projections. (Each direction of travel should be modeled as a separate roadway on divided highways). Sound level meter measurements should not be located closer than 10 feet from a building. Therefore, when taking field measurements at receptor sites involving buildings, the meter should be located at least 10 feet from the closest corner and at an equal distance to the highway. In the case of outdoor areas, the closest active recreational use facility (e.g., patio, campground site, swimming pool, tennis court, picnic shelter) to the highway is to be used as the receptor location in modeling traffic noise impacts and attenuation projections.

Relative Noise Impact – One of two criteria used to determine when a noise impact occurs. Under this criterion, a noise impact occurs when the project design year noise level exceeds the existing traffic noise level by 15 dBA or more; even if it does not approach or exceed the ‘Absolute’ noise abatement criteria.

Shielding factor – Any constructed or natural barrier located between the roadway and receptor which provides a reduction in roadway traffic noise at the receptor site.

Substantial Increase – Alternative to the term ‘relative noise impact’.

Substantial Reduction – Noise level reduction of at least 5 dBA at impacted receptors.

Ten-point Transect – A line perpendicular to the highway upon which noise receptor locations are modeled at 50ft, 75ft, 100ft, 125ft, 150ft, 200ft, 250ft, 300ft, 400ft, and 800ft from centerline of an undivided highway or directional centerline in the case of a divided highway. This transect data will be provided to local officials in an effort to prevent future traffic noise impacts on currently undeveloped lands in conformance with 23 CFR 772.15. This transect data is also useful in determining the distance to model receptor locations on developed sites regarding noise impact analysis.

Trucks – Heavy trucks have 3-axles or more, medium trucks have 2-axles and 6-wheels.

Type I Project – Generally, a proposed highway construction at a new location or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of traffic through lanes. (See Section 1310.01 for details)

Type II or Retrofit Project – A stand alone federal-aid project (retrofit project) for noise abatement on an existing highway. (See Section 1350.07)

1320.00 - Applicable Statutes and Regulations

1320.01 National Environmental Policy Act

The National Environmental Policy Act (NEPA), 42 USC 4231, requires that all actions sponsored, funded, permitted, or approved by federal agencies undergo planning to ensure that environmental considerations such as noise impacts are given due weight in project decision-making. Federal implementing regulations are at 23 CFR 771 (FHWA) and 40 CFR 1500-1508 (CEQ).

1320.02 Federal-Aid Highway Act of 1970 and Implementing Regulations

The Federal-Aid Highway Act of 1970 authorized the development of highway traffic noise standards. 23 USC 109 (i) directs the Secretary of Transportation to develop and implement traffic noise standards for highway projects. Noise impact criteria and abatement procedures implemented by FHWA are in 23 CFR 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise). This regulation requires preparing a noise study to determine what noise impacts, if any, will result from the proposed highway improvement and what measures will be taken to lessen these impacts. If noise impacts are expected, noise-reduction measures that are determined by ITD and FHWA to be reasonable and feasible must be incorporated into the highway improvement. Laws and regulations can be accessed at the web site below:

<http://www.access.gpo.gov/nara/cfr/>

1330.00 - (Reserved)

1340.00 - (Reserved)

1350.00 - Technical Guidance

Guidance for conducting traffic noise studies and preparing documentation is provided in the material described in this section. The purpose of this guidance is to determine if the proposed project will create noise impacts, and if so, the likelihood of providing abatement measures. In addition, to lessen the likelihood of future noise impacts, local officials are to be provided appropriate information for their land-use planning and implementation efforts.

1350.01 Information for Local Officials

- District/LHTAC environmental staff will provide the local jurisdiction with an estimation of future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project. (See Exhibit 1300-1)
- District/LHTAC staff will also provide information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels. Local officials responsible for issuing

building permits or approving plat requests for future development adjacent to the project should be encouraged to include a statement on the permits/plats indicating that the developer will be responsible for either avoiding traffic noise impacts or providing any associated abatement.

- District/LHTAC staff will provide local officials with information regarding eligibility for Federal-aid participation for Type II projects as described in 23 CFR 772.13(b). ITD does not program Type II projects. (Refer to Section 1350.07 for further information on Type II projects).
- In addition, local officials are to be reminded that after the date of public knowledge, ITD & FHWA are not responsible for noise abatement in the project area.
- Notification shall be sent to local officials by the District/LHTAC no later than 10 days after approval date of the CE, FONSI, or ROD by FHWA.

Exhibit 1300-1 and **Exhibit 1300-2** display the recommended format and sample cover letter for the local officials information. This information will be sent by the District or LHTAC to the Mayor/City Manager or Chairman of the Board of County Commissioners with copies, as applicable, to:

- Chairman of the Planning Commission
- Director of the Planning and Zoning Dept.
- City/County Engineer
- Chief Building Inspector
- HQ Environmental Manager

1350.02 Traffic Noise Screen

- A noise screen will be conducted by District environmental staff or LHTAC on all Type I projects, except projects involving new alignments. Projects involving new alignments will generally require a traffic noise impact analysis (Section 1350.03).
- District/LHTAC environmental staff will use the FHWA TNMLOOK model to determine the predicted design year traffic noise level at selected distances from the roadway centerline and to determine if the proposed project will involve traffic noise impacts for adjacent landowners. Typically, this will involve a ten-point transect and an examination of the closest receptor to centerline. If the closest receptor to centerline is a category C, then the closest category B receptor within 400 feet of the roadway shall also be examined. (Category A, D and E receptors should be referred to ITD HQ for resolution). Model input should be based on design year/design hour volumes (DHV) at posted speeds. TNMLOOK is based on a straight roadway and flat terrain; as conditions deviate from this, reliability decreases.
- If the closest category B receptor to the roadway does not exceed 60 dBA and no traffic noise impacts are anticipated on undeveloped lands where development is planned, designed and programmed, then no further noise analysis is necessary (assuming no noise sensitive category C receptor is predicted to approach or exceed 65 dBA in the design year). The noise model printouts showing these results should be attached to the Environmental Evaluation submittal package or

EA and appropriately referenced in the document. For example the Environmental Evaluation 654 Form would have 'No' checked alongside "#1. Noise" and a short statement referencing the noise printout in the Environmental Evaluation Summary Sheet or the EA Impact Section, such as: *"As indicated on the attached Noise Screen Printouts, the predicted noise level at the closest residence to the roadway is __ dBA; since this level is noticeably below the FHWA Noise Abatement Criteria, the project will not result in a traffic noise impact"*.

- If predicted design year noise level exceeds 60 dBA for a Category B receptor or 65 dBA for a Category C receptor, District/LHTAC environmental staff will notify HQ Environmental Section that further screening is required. HQ Environmental Staff will perform on-site calibration procedures and screen the closest category B receptor to centerline for design year traffic noise impacts using the latest version of TNM (currently TNM 2.5). If the closest category B receptor to the roadway (including undeveloped lands where development is planned, designed, and programmed) does not exceed 66 dBA or 71 dBA for a Category C receptor, no further noise analysis is necessary.
- If the screening process indicates that the project involves unresolved traffic noise impacts, then continue to section 1350.03. Typically, section 1350.03 will involve the services of a traffic noise consultant .

1350.03 Traffic Noise Impact Analysis

The outline below serves as a general guide for preparing a traffic noise analysis report. The latest version of TNM is the required analysis method after 2 May 2005. The report may contain information regarding sound, decibel levels, the causes of traffic noise and other background information deemed important by the District or consultant for public hearing or distribution purposes; but as a minimum must include:

- A description of the Project and Affected Environment
 - A brief description of the project identifying it as a Type I.
 - Identify the local jurisdiction and their efforts/ordinances to promote compatibility between future land development and highways regarding noise abatement; especially note if they continue to allow residential development adjacent to arterials unabated.
 - A description of the adjacent land use activities, undeveloped lands for which development is planned, designed and programmed and if the land use is changing.
 - Depict the zoning on the project area graphics.
- A Determination of Existing and Design Year Noise Levels and Impacts
 - Include a Table displaying existing and design year noise levels, which includes posted speeds and distance to centerline for receptor locations (no-build & build). Highlight dBA levels which approach or exceed noise abatement criteria in bold print. A sample table is presented in **Exhibit 1300-3**. Formatting the table in this manner is recommended to facilitate application of the abatement checklists.

Notes:

1. Each direction of travel should be modeled as a separate centerline on divided roads.

2. Document all noise levels on the Table in whole numbers.

Note:

Analysis, modeling, and field measurements result in decimal dBA values, however, these decimal values should be rounded (not truncated) to the nearest whole number for presentation in the tables and text of the analysis report.)

3. Because design year noise levels can only be determined by computer modeling, existing noise levels shall also be determined by computer modeling to allow a direct comparison of noise levels obtained by the same methodology.

- Field measurements using a Type I or II sound level meter are required to calibrate and validate the model. Representative sites, including the closest residence to the roadway, are to be selected for measurement. Each site selected shall include three 6-minute or two 10-minute traffic counts (cars, medium trucks & heavy trucks) concurrent with a sound level meter reading (Longer counts may be necessary for low volume roads).

Notes:

1. 10 minute counts are easily converted to 60 minute counts for insertion into the FHWA model by simply multiplying the respective vehicle count by 6.
2. Additional counts or sampling periods greater than 10 minutes may be required to ensure statistically reliable data, as determined by the noise analyst's judgment and based on the traffic volumes of the roadway under study (i.e., lower volume roadways often require longer sampling periods, and time periods of an hour or longer could be required)].
3. Actual meter readings are to be compared with results from the FHWA model. Adjustments to variables within the model may be necessary to calibrate the model. To be validated, the model must be within 3 dBA of the applicable meter reading; unless it is documented that site conditions or noise from other sources has a noticeable affect on the field measurements.

- Field measurements are also used to determine influential noise sources in the project area. In cases where highway traffic is not the dominant source of noise, the dominant source must be identified and noise levels produced by that source(s) displayed on the Table and factored into the analysis.

- Truck percentage ratio between medium and Heavy trucks should be determined from observed traffic counts, if not otherwise available.

- Include graphics identifying receptor locations & type, right-of-way lines, centerlines, property access, crossroads, and any shielding & proposed barrier information. Receptors located on hilly terrain may require topographic contour lines and spot elevations, whereas this data can typically be ignored given relatively level terrain conditions. Graphics depicting impacted receptors at an appropriate scale are emphasized.

- Include a narrative identifying NAC criteria, receptors impacted & severity of impact [e.g., are impacts less than, equal to, or greater than the no-build scenario; are increases unnoticeable (< 3 dBA), slightly noticeable (3 to 5 dBA), noticeable (5 to 15 dBA), or substantial (>15 dBA).
- Examination and Evaluation of Noise Abatement Measures
 - Non-barrier & Barrier Checklists (**Exhibits 1300-4 & 1300-5**, respectively) serve as a general guide and should be used by the traffic noise analyst to assess noise abatement measures for those receptors determined to be impacted by traffic noise from the project. Both of these checklists first consider feasibility of noise abatement. The noise analysis is ended for any impacted receptors found to be not feasible for abatement. When measures are deemed feasible, the checklists proceed to evaluations of reasonability of abatement. Upon completion of both the feasible & reasonable sections of the checklist, It is turned over to the District decision makers to be used as a basis in determining whether or not abatement measures are proposed for implementation.

Notes:

1. Truck Restrictions may be evaluated as a traffic management measure to mitigate traffic noise in cases where such restrictions do not conflict with the intended use of the roadway or create unreasonable delay or hardship on the motoring public.
2. Speed restrictions may be evaluated as a traffic management measure to mitigate traffic noise where these restrictions do not conflict with the roadways designated use, they do not create unreasonable delay or hardship on the motoring public, and they do not create a safety or enforcement problem.

A depressed roadway can effectively mitigate much of the traffic noise to adjacent receptors. If a project needs additional fill material, a lower roadway grade may be a cost effective method to provide fill material while reducing traffic noise, or to provide berm material for noise barrier purposes.

- The District will complete the Noise Abatement Decision document (**Exhibit 1300-6**) for each receptor or group of receptors impacted, using the above checklists for guidance. Completion of this checklist documents the Districts determination regarding whether or not to proceed with noise abatement for a particular receptor or group of receptors. If the Environmental Document is being prepared by a consultant, the District should provide them with their decision regarding receptor abatement.
 - Notes:
 1. The Environmental Document text should identify “no solution” receptors for which abatement is not feasible or not reasonable & why, and
 2. The Environmental Document text should include costs, noting receptors for which measures are feasible & reasonable and ‘likely’ to be incorporated into the project.
- Prior to implementation of a proposed noise wall, however, a majority of

impacted property owners must agree that it is desirable. Desirability may be determined (with or without the assistance of consultants) at a public hearing, by petition, by mailed questionnaires/surveys, or as otherwise determined acceptable by the FHWA and ITD.

- Notes:

1. It is noted in Section 1350.02 that in the case of category C uses, the District may inquire about desirability of a noise wall immediately after determining that is feasible, since most commercial/industrial enterprises do not want them because of exposure limitations.

The views of impacted residents are to be a major consideration in reaching a decision on noise barrier implementation (i.e., Barriers will not be built if most affected residents do not desire them).

- Construction Impacts

- Construction noise should be addressed in a general manner with emphasis on the temporary nature of any adverse effects.
- Common, easy to implement measures to minimize construction noise should be included in the plans and specifications for a highway project (e.g., work-hour limits, equipment muffler requirements, etc.). **Exhibit 1300-7** provides an example of how to address construction noise impacts for routine projects.
- The calculation of noise levels for highway construction equipment is normally not required in a traffic noise analyses.

- Analysis Methodology

- Traffic data used (volumes, mix, posted speed) and source,
- Explain any alpha factor or other adjustments to the model (shielding, barrier cost assumptions, etc.),
- Any other applicable assumptions, along with a statement explaining that the analysis conforms with 23 CFR 772.

Supporting documents to the Traffic Noise Impact Report include:

- Input & Output tables (current existing, design year existing, design year proposed),
- Barrier & Non-Barrier Checklists worksheets,
- Traffic data sheets, and

As appropriate;

- Typical sections,
- Photographs,
- Bibliography/References,
- Excerpts from local ordinances or land-use plans,
- Construction noise/mitigation for non-routine circumstances (i.e., projects with unusually severe highway construction noise impacts).

1350.04 Data Requirements

Before requesting a traffic noise impact report, the ITD/LHTAC project manager may

consider reducing consultant costs by using state forces to compile relevant data that will be needed by the analyst. Such data can include:

- Plan sheets or Micro Station files for the project showing
 1. Receptor locations (labeled as to type),
 2. Current and proposed route centerlines & right-of way lines,
 3. Current zoning classifications,
 4. Topography & spot elevations,
 5. Scale & north arrow,
- Provide land use information and zoning maps and indicate whether or not the local jurisdiction anticipates any changes in the project area regarding zoning and land use, and note if they have any noise controls in effect which preclude landowners/developers from creating new noise sensitive land uses adjacent to the route.
- Provide typical sections of existing and proposed route.
- Provide current and design year traffic data , including traffic volumes (DHV) and truck % on project area roadways (this data is required for any crossroads that may impact receptor locations or interfere with abatement considerations and for each project section for which there is a change in posted speed or 25% change in traffic volume).
- Provide current and projected posted speeds on all roadway sections in the project area
- Indicate any other important sources of noise in proximity to the project area (e.g., railroad, airport, industrial site, crusher operation, etc.) and give the location and approximate distance to the route in question.
- Note any special route characteristics (e.g., truck route, signing to prohibit trucks at certain times, one-way traffic, business route, etc.)
- Provide any other information deemed important to the noise analysis; this may include survey data, petitions, complaints, route history, when adjacent subdivisions were given final plat approval, when building permits were issued, any direct/indirect effects on historical sites, jurisdictional desires, etc.)

1350.05 Consultant Scopes of Work

Exhibit 1300-8 is a sample scope of work that can be used as a guide in contracting with consultants for traffic noise impact studies.

1350.06 ITD Traffic Noise Analysis and Abatement Policy and Procedures

- ITD will provide constructive recommendations to local jurisdictions to avoid future traffic noise impacts when they are considering development permits adjacent to highways.
- ITD will consider abatement measures to alleviate traffic noise impacts adjacent to Type I projects, and implement any measures considered feasible and reasonable.
- ITD will consider residences and other sensitive land uses to be reasonable candidates for the construction of noise walls. All abatement measures that are warranted, feasible and reasonable will be incorporated into the project specifications. However, providing effective sound barrier protection above the

first floor of a multi-story sensitive receptor is normally not considered reasonable. (Walls constructed tall enough to break the line of sight for upper story units are seldom acceptable to ground floor residents and the additional reinforcement and foundation improvements for wind loading result in significantly greater construction costs.) Exceptions involve multistory apartments constructed below highway centerline because of terrain conditions.

- ITD considers parking lots, highway businesses and other commercial or industrial enterprises as uses typically located adjacent to highways for exposure purposes and highly dependant on transportation access; therefore they are considered noise tolerant receptors and given less emphasis for traffic noise abatement. In fact, these type uses are preferred located adjacent to higher volume roads as a noise buffer to the more sensitive uses such as residential developments.
- ITD advocates that local jurisdictions use their power to regulate land development in such a way that noise-sensitive land uses are either not allowed adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that traffic noise impacts are minimized.
- Noise barriers may not normally be feasible for dwellings with access directly onto the highway (i.e., for reasons of poor barrier performance and poor sight distance). Reconfiguring neighborhoods, including streets, houses and access to private property, to arrange noise walls would not normally be considered feasible; except in cases where moving a driveway access can benefit project design/purpose or, with the consent of the property owner, can be arranged in such a manner that an effective sound wall can be constructed without exceeding cost reasonableness criteria.
- Although all six abatement measures in 23 CFR 772.13(c) will be fully considered, typically noise barriers are primarily the only feasible and reasonable noise abatement measure. Abatement costs include the cost of construction and right-of way acquisition.
- A noise abatement measure will not be implemented where it will create a hazard, violate design standards or create an adverse impact on a cultural resource on-or-eligible for the National Register of historic places. [Although the following conditions can often be resolved thru use of good design principles; consider recovery zone, snow accumulation and removal, sight distance, barrier rail, drainage, utility easements, etc.]
- Noise insulation of public use or non-profit institutional structures may be considered for those cases dealing with interior traffic noise impacts created by the ITD project.
- Noise abatement will not be implemented if the majority (50% +1) of the impacted people are in opposition or indifferent to noise mitigation. Opposition to barrier construction shall be documented in writing, such as formal surveys or petitions.
- Trees and shrubs provide psychological benefits regarding traffic noise and may be provided for privacy or aesthetic purposes, but are not considered as a noise abatement measure, except as noted in the example below.
- Reasonable effort should be made to preserve natural vegetation whether or not

noise abatement is proposed. Vegetation softens the landscape and dense stands of vegetation that already exist along a highway, for example, may provide a perceptible amount of noise reduction for some receptors and should be preserved when possible (e.g., vegetation 15 feet high by 100 feet deep and dense enough not to be seen through, provides a 5 dBA decrease in noise levels).

1350.07 Type II Noise Evaluation Procedures for Existing Highways.

ITD does not program Type II projects. Local jurisdictions, however, who have adopted traffic noise control ordinances regarding new development may desire to program such projects. Any local jurisdiction desiring to expend Federal-aid highway funds for Type II abatement should develop a jurisdiction-wide Type II program (i.e., survey, analyze, prioritize, and implement). A Type II program can insure uniformity and consistency in the decision-making process, thereby avoiding 'arbitrary and capricious' actions vulnerable to complaints of discrimination. If programmed, any Type II project proposed for Federal-aid highway participation would be covered by the provisions of State and Federal noise policy. Type II abatement may not be approved for homes that were constructed prior to a local community's adoption of an active noise-compatible land use control program.

23 CFR 772.13(b) states that noise abatement measures will only be approved for Type II projects that were approved before 28 November 1995, or are proposed along lands where land development or substantial construction predated the existence of the highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.

To avoid any potential Title VI and/or Environmental Justice complaints, local jurisdictions may consider constructing retrofit noise abatement (Type II projects) using only local or private funds.

1350.08 Noise Barrier Information Database and Evaluation of Cost Effectiveness.

ITD will maintain a database of noise barrier information, consisting of the following information for all completed projects which required noise barriers:

- Project Name and Number
- Route and County location
- Barrier Type and material
- Construction date
- Barrier length (linear feet)
- Barrier height
- Total cost of barrier
- Unit cost per square foot of noise wall

Cost information derived from this database will be used to establish barrier cost planning estimates and cost effectiveness. Barrier cost planning estimate will be based

on the average unit price of noise walls on representative recent projects. Initial values of the barrier cost planning estimate and the limit of cost-effectiveness have been established as identified in Section 1310.03. The inflation rate between March 2005 and March 2009 will be used to adjust the dollar amount for cost/benefited receptor. An initial review of these items will be submitted by ITD to FHWA in July 2009. This information and possible effectiveness review submittals will include complete information from the noise barrier database, along with ITD's computations and recommendations for adjustment of these values.

1350.09 FHWA Guidance and Reference Information

- **FHWA Technical Advisory T6640.8A** (October 1987)

This document gives guidelines for preparing environmental documents. For noise, summary of the noise analysis should include the following:

- Brief description of noise-sensitive areas, including developed and undeveloped areas for land uses such as residences, business, schools, and parks.
- Extent of the impact (in decibels) at each sensitive site.
- Noise abatement measures considered for each impacted area, and costs for those likely to be incorporated into the proposed project.
- Noise impacts for which no prudent solution is reasonably available and the reasons why.

<http://www.fhwa.dot.gov/progdev/impTA66400.asp>

- **FHWA Highway Traffic Noise Regulations & Guidance**

The following web site links include the June 1995 Highway Traffic Noise Analysis & Abatement Policy and Guidance, 23 CFR 772 Regulations, guidance on Quiet Pavement Pilot Programs, as well as traffic noise prediction models and measurement technologies

http://www.fhwa.dot.gov/environment/noise/mem_nois.htm

FHWA Guidance on Construction Noise

The latest (2 Oct 06) FHWA guidance on highway construction noise can be found online at:

http://www.fhwa.dot.gov/environment/noise/cnstr_ns.htm

Other Technical Resources

FHWA's Highway Traffic Noise home page contains links to numerous references on highway traffic noise analysis and abatement resources:

<http://www.fhwa.dot.gov/environment/noise>

Section 1360.00 - Permits and Approvals

In most cases, noise from construction activities is exempt from local laws. However, each local jurisdiction will need to be contacted to determine the local regulation and if a permit is required.

Section 1370.00 - (Reserved)

Section 1380.00 – Exhibits

Exhibit 1300-1	Information for Local Officials (Sample)
Exhibit 1300-2	Cover Letter re: Information to Local Officials
Exhibit 1300-3	Sample Table Displaying Receptor information
Exhibit 1300-4	Non-Barrier Checklist
Exhibit 1300-5	Barrier Checklist
Exhibit 1300-6	Noise Abatement Decision Checklist
Exhibit 1300-7	Construction Noise Impacts for Routine Projects - Example
Exhibit 1300-8	Consultant Scope of Work - Example

INFORMATION for LOCAL OFFICIALS

In Accordance with 23 CFR 772.15

The Federal Highway Administration (FHWA), has established absolute noise level guidelines for several categories of land use activities; which include the following L_{eq} noise levels:

Category A	$L_{eq} = 57$ dBA	Lands on which "serenity and quiet are of extraordinary
Category B	$L_{eq} = 67$ dBA	Picnic areas, recreation areas, parks, residences, motels,
Category C	$L_{eq} = 72$ dBA	Properties/activities which are not included in category A

Table 1
Projected Design Year (2025) DHV L_{eq} Noise Levels (dBA)
@ Selected Distances & Posted Speeds
WAYNE, ID

94		4th St.	1st Blvd	I-
	Transect:	<u>30mph</u>	<u>35mph</u>	
	<u>65mph</u>			
	1. 50' of CL [Centerline]	65	66	NA
	2. 75' of CL	63	65	NA
	3. 100' of CL	60	63	76
	4. 125' of CL	59	62	74
	5. 150' of CL	58	61	73
	6. 200' of CL	56	59	71
	7. 250' of CL	55	58	70
	8. 300' of CL	54	57	68
	9. 400' of CL	52	54	67
	10. 800' of CL	47	50	62

Noise abatement measures recommended for consideration by the local jurisdiction in the project area:

- (1) Requiring developers to implement suitable noise abatement measures in those cases where adequate setbacks or buffer zones are not maintained (e.g., berms, sound walls, insulation, double/triple pane windows, etc.);
- (2) Requiring acceptable setbacks or buffer zones for new residential units or developments (i.e.; Table 1 indicates 75' of centerline would be an appropriate distance to construct residences adjacent to 1st Blvd in order not to approach or exceed FHWA noise abatement guidelines);
- (3) Maintaining appropriate zoning for non-sensitive land uses adjacent to the route;
- (4) Lowering or maintaining (not raising) the current posted speed limits.

- (5) Include a statement on any development/building permit indicating that the developer will be responsible for either avoiding traffic noise impacts or providing any associated abatement.

Type II Project Eligibility [23 CFR 772.13(b)]

For Type II projects, noise abatement measures will only be approved for projects that were approved before November 28, 1995, or are proposed along lands where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.

Date of Public Knowledge

The approval date of the environmental determination (i.e., CE, FONSI, ROD); after this date FHWA & ITD are no longer responsible for providing noise abatement for new development adjacent to the highway project.

The date of public knowledge for this project is:
.....

**Sample Cover Letter
re: Information to Local Officials**

[The following is a sample letter of notification to local officials concerning possible future development noise impacts from an ITD project. Notification shall be sent to local officials by the District/LHTAC no later than 10 days after approval date of the CE, FONSI, or ROD by FHWA.]

4 July 2005

Webster County Commissioners, Chairman
Box 1776
Mason, Idaho 83000

RE: Project STP-7777 (333)
US66, Mason to Jct. SH99
Key No. 4432

Dear Mr. Smith,

The Idaho Transportation Department is proposing to construct an additional lane on each side of US66 from Mason Street to the junction of SH99 in Webster County. This road widening project will result in traffic noise projections as depicted on the attached table of transects.

The attached table of transects were completed during the course of the traffic noise analysis for this project. This information depicts the noise level anticipated to be produced by the projected design year traffic volume (year 2025). There are a number of vacant properties along US66 that may be developed over the next several years and construction close to the travel lanes may result in a volume of noise sufficient to exceed Federal traffic noise abatement criteria. In planning for future development along the US66 project limits please note that traffic noise may become a factor and that any building or development plans should take this issue into consideration.

This notification of future noise impacts and the possibility of Federal funding for noise abatement are issued in accordance with 23 Code of Federal Regulations 772.15.

Sincerely,

Attachment

Cc: Planning and Zoning Commission
City Planning Department
County Planning Department
Local Metropolitan Planning Organization

City Mayor

ITD Environmental Manager

The example is addressed to the County Commissioners and copied to several entities. Each project will be different and the appropriate agencies and entities will be selected for notification according to which agency has jurisdiction in the project area. The letter must include the predicted (design year) noise levels at prescribed distances from the centerline of the street or road. If the District/LHTAC wishes to do so, the letter may state that the district, LHTAC or HQ staff is available for additional information on noise abatement if desired by the agency contacted.

Table 1
Current & Projected L_{eq} Noise Levels (dBA)
US95

Receptor LEVEL (See Fig. 1)	Distance from Centerline		NOISE		
	<u>Existing</u> <u>Proposed</u>		<u>1998</u>		
	<u>2018</u>			<u>W/O Project</u>	<u>With</u>
<u>Project</u>					
65 mph Section:					
# 1-Residence	98'	Displace	67.9	69.8	Displace
# 2-Salvage	39'	69'	72.0	73.9	71.4
# 3-Mobile Home	250'	207'	63.6	65.5	66.4
# 4-Residence	122'	79'	67.0	68.8	70.8
# 5-Radio Station	129'	86'	66.7	68.5	70.4
45 mph Section: (No Receptors)					
35 mph Section:					
# 6-Church	163'	NC	61.1	63.1	63.1
# 7-Car Dealer	119'	NC	61.9	63.8	63.8
# 8-Farm Equip.	161'	158'	60.3	62.3	62.4
# 9-Car Rental	132'	135'	61.1	63.1	63.0
#10-Restaurant	144'	141'	60.6	62.6	62.7
#11-Tavern	89'	79'	62.6	64.6	65.2
#12-MH Court	119'	109'	61.3	63.3	63.7

Exhibit 1300-4 Non-Barrier Checklist

Project Name: _____ Project# _____
Key# _____

Receptor(s)

Idaho Transportation Department (ITD)
NON-BARRIER NOISE ABATEMENT CHECKLIST

FEASIBILITY:

YES NO

1. Can traffic management measures be implemented which conform to the purpose of the project and achieve at least a 5 dBA reduction in sound levels at the impacted receptor(s)? _____
2. Can alignment alteration be implemented which conforms to design standards and achieves a 5 dBA reduction in sound levels at the impacted receptor(s)? _____
3. Can a buffer zone be provided which achieves a 5 dBA reduction in sound levels at the impacted receptor(s) and results in no displacements? _____
4. Is there an impacted public use or non-profit institutional structure in the project area and can insulation be provided which achieves a 5 dBA reduction in sound levels inside the structure? _____

If **no** to all of the above, these measures are not feasible.
END

If **yes** to any of the above, the measure is feasible, therefore consider the following:

REASONABILITY:

YES NO

1. Does cost of implementation meet the cost per benefited residence criterion? _____
2. Does this measure conform to local plans and land use regulations? _____
3. Is the measure consistent with state and federal environmental laws, _____

regulations and best management practices? _____

NOTE: If the Noise Analyst is aware of considerations such as imminent land-use changes, indirect impacts, noise sources other than those modeled, etc., they should be noted on the back of this form.

DESIRABILITY:
YES NO

Does the local jurisdiction endorse the measure(s)? _____

Exhibit 1300-5 Barrier Checklist

Project Name: _____ Project# _____

Key# _____

Receptor(s) #..... _____

Design year 'build' dBA level.. _____

ITD NOISE BARRIER ABATEMENT CHECKLIST**BARRIER****FEASIBILITY:****YES NO**

1. Can the barrier achieve at least a 5dBA sound level reduction at the impacted receptor without limiting property or neighborhood access? _____
2. Does the barrier conform to project standards regarding traffic safety, maintenance and drainage concerns, considering that these issues can often be resolved through use of good design practices? _____
3. Can an effective barrier be constructed considering the existing site characteristics and topography, and without reconfiguring the site or neighborhood (not including minor access modifications)? _____
4. Is traffic noise the dominate noise source in the project area, and will the barrier be effective in spite of any other source not associated with the project? _____

If **no** to any of the above, the barrier is not feasible.
END

If **yes** to all of the above the barrier is feasible, therefore consider the following:

BARRIER REASONABILITY:

	YES		NO	
	High	Low	Low	High
1. Development pre-dated highway construction	_____	_____	_____	_____
	>80%	50-80%	30-49%	<30%
2. Development in place before 1976	_____	_____	_____	_____
	>80%	50-80%	30-49%	<30%
3. Type of Development*	_____	_____	_____	_____
	Dwelling	School	Office	Retail
4. Design year 'build' dBA level > current year no-build	_____	_____	_____	_____
	>10dBA	5-10	3-4	<3dBA
5. Design year 'build' dBA level > design year no-build	_____	_____	_____	_____
	>5dBA	3-5	0-2	<0dBA
6. Cost per residence benefited	_____	_____	_____	_____

			<\$17K	\$17-22.5K		
\$22.5-28K	>\$28K					
7. Have efforts been made at the local level to prevent incompatible development adjacent to highways?		_____	_____	_____	_____	
		Major	Moderate	Minor	None	

BARRIER DESIRABILITY:

Do a majority (50% + 1) of impacted residents want a barrier? YES____ NO____(END)

***Dwelling**-includes residences, condos, apt's., areas of frequent outdoor use associated with quiet & 'Cat. A' uses.

School- includes libraries, churches, hospitals, and outdoor areas associated with infrequent or noisier activities.

Office- includes low volume commercial uses, and motels/hotels with outdoor accommodations for guests.

Retail-includes parking lots, industrial uses, shopping centers, convenience stores, highway businesses, etc.

Exhibit 1300-6 Noise Abatement Decision Checklist

Project Name: _____ Project# _____
Key# _____

Idaho Transportation Department (ITD)
NOISE ABATEMENT DECISION CHECKLIST

DISTRICT/LHTAC DECISION regarding the following receptor(s)

Yes No

___ ___ A traffic noise impact has been identified [23 CFR 772.13(a)(1)].
(Relative or Absolute)

___ ___ The noise abatement measures will (effectively) reduce the traffic
noise impact [23 CFR 772.13(a)(2)].

___ ___ The impacts for which the mitigation is proposed actually result from
the Administration action [23 CFR 771.105(d)(1)].

___ ___ The proposed mitigation represents a reasonable public expenditure
after considering the impacts of the action and the benefits of the proposed
mitigation measures [23 CFR 771.105(d)(2)].

Based on the studies so far accomplished, the State/local jurisdiction **intends to install noise abatement measures** in the form of.... (e.g., a barrier at _____). These preliminary indications of likely abatement measures are based upon preliminary design for a barrier cost of \$_____ that will reduce the noise level by _____dBA for _____ residents.)

(Note: If it subsequently develops during final design that these conditions have subsequently changed, the abatement measures might not be provided. A final decision of the installation of the abatement measure(s) will be made upon completion of the project design and the public involvement processes. Also, a barrier should not be rejected for any one single reasonability criterion noted on 'Barrier Checklist', unless a majority of impacted residents do not want it.)

Based on the studies so far accomplished, the State/local jurisdiction **does not intend to install** noise abatement measures for the following reasons:

- ☐ Abatement measures are not effective
- ☐ Project traffic noise is not the dominate noise source
- ☐ Abatement measures conflict with the purpose of the project
- ☐ Receptors are considered noise tolerant (ie., commercial, highway business, industrial, etc.)
- ☐ Unnoticeable change (<3dBA) in noise level between design year build and no-build alternatives
- ☐ Local ordinances allow development along highways without consideration for noise abatement
- ☐ Traffic noise impacts are a result of development occurring after the highway was constructed
- ☐ Traffic noise impacts resulted from development occurring after the 1976 NAC became effective
- ☐ Cost per benefited residence is excessive
- ☐ Other, comment:

PREPARED

BY

DATE _____

District/LHTAC Environmental Planner/Engineer

**CONSTRUCTION NOISE
[EXAMPLE FOR A ROUTINE PROJECT]**

The most prevalent construction noise source is equipment powered by internal combustion engines (usually diesel). Noise from equipment likely to be used on this project (tractors, trucks, graders, pile drivers, etc.) will range to about 95 decibels (dBA) when measured from a distance of 15 meters (50'). To reduce the impact of construction noise, most construction activities will be confined to the period least disturbing to adjacent and nearby residents, between 7:00am and 7:00pm on weekdays. Mitigation of potential highway construction noise impacts shall incorporate low-cost, easy-to-implement measures into project plans and specifications (e.g.; equipment muffler requirements, work-hour limits).

Highway Noise Analyses Sample Scope of Work

The CONSULTANT shall prepare a technical memorandum documenting the methodology and assumptions used to guide the noise analysis.

The CONSULTANT shall conduct a reconnaissance of the project study area to identify all of the land uses and locate noise sensitive properties within ____ feet of the project (to be determined by District/LHTAC) as described in 23 CFR Part 772.

The CONSULTANT shall note physical and terrain features that affect noise propagation and features which may be altered during construction.

The CONSULTANT shall then conduct a noise study for the project area based on the guidelines presented in the current 23 CFR 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise, and the ITD Traffic Noise Abatement Policy and Procedures. Noise measurements will be conducted at sites as needed to calibrate the traffic noise model and to verify the predominate noise source in the project area. Calibration measurements will be conducted for a minimum of 6 minute sampling periods during daytime hours when traffic is moving freely. At each measurement site, traffic counts will be conducted concurrently with the noise measurements. Any noteworthy noise source will be identified especially those that may interfere with future mitigation determination. Traffic volumes that are counted during the noise measurement survey will be modeled and the resulting sound levels will be compared with the measured sound levels to reach close agreement. The use of shielding and alpha factors may be needed to adjust modeled receptor noise levels. Once the model has been calibrated, design hour traffic volumes (DHV) will be used with posted speeds to calculate existing and design year (build & no build) noise levels. In locations where there are no existing roadways, field measurements will be conducted for a minimum 15 minute sampling periods during daylight hours and used to represent the existing noise level.

The CONSULTANT shall model the future year traffic noise level with and without the proposed project using the FHWA Traffic Noise Model (TNM). Noise levels in the design year for each alternative will be modeled at selected noise sensitive receptors based on forecast design hour traffic volumes (DHV). Modeling must be adequate to accurately predict the noise levels at each of the receptors, assess the number of properties that are impacted or will be impacted and determine the increase in traffic noise and amount of reduction to each receptor as a result of mitigation.

In accordance with FHWA and ITD requirements, noise abatement measures will be considered at locations along the alignments where traffic noise impacts are predicted. Mitigation measures considered must include the six measures outlined in 23 CFR 772.13(c).

The CONSULTANT shall provide location, length, height, profile, estimated cost and number of benefited noise sensitive receptors for each proposed barrier. The analysis will contain a complete discussion of impacted areas/receptors that do not meet ITD's criteria for abatement and specifically note reasons for not including mitigation. The CONSULTANT in accordance with ITD's procedures will qualitatively assess construction activities that may cause annoyance at nearby noise sensitive land uses.

The CONSULTANT will discuss any local laws applying to construction noise.

Deliverables:

1. Noise Model Data files,
2. Record of field measurements and traffic counts,
3. Noise Analysis Technical Memorandum containing:
 - 3.1. Tables of contents, figures and charts
 - 3.2. A summary including the impacts of each alternative and mitigation recommended
 - 3.3. A map showing centerlines, receptors, R/W lines, zoning, and relevant shielding factors.
 - 3.4. Noise descriptors used in the report
 - 3.5. Discussion of methodology used, including: abatement criteria, noise model, traffic data, speeds, vehicle type percentages and design hour volumes for existing and design year for each alternative.
 - 3.6. Discussion of existing land use including areas of zoning and major terrain features.
 - 3.7. Discussion of existing and future noise levels.
 - 3.8. An impact analysis that includes a table comparing the noise levels at each receiver for existing conditions and the design year for each alternative as well as the number of sensitive residences or other sites represented by each receiver.
 - 3.9. A mitigation analysis that includes a discussion for each impacted area/receptor and proposed mitigation.
 - 3.10. A construction noise section
 - 3.11. Barrier & non-barrier checklists